DOCUMENT RESUME

ED 471 681 PS 030 842

AUTHOR	Zimmerman, Barry J.
TITLE	Achieving Self-Regulation: The Trial and Triumph of Adolescence.
PUB DATE	2002-00-00
NOTE	28p.; In: Academic Motivation of Adolescents. Adolescence and Education Series; see PS 030 841.
AVAILABLE FROM	Information Age Publishing, Inc., 80 Mason Street, Greenwich, CT 06830. Tel: 203-661-7602; Fax: 203-661-7952; Web site: http://www.infoagepub.com.
PUB TYPE	Information Analyses (070)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS
DESCRIPTORS	Adolescent Attitudes; Adolescent Behavior; *Adolescents; Cognitive Processes; *Learning Motivation; *Metacognition; Modeling (Psychology); Models; *School Organization; *Self Control; Self Motivation; Social Cognition; Social Support Groups; Socialization; *Student Motivation; Study

ABSTRACT

Self-regulation consists of the metacognitive processes, behavioral skills, and associated motivational beliefs that underlie youths' growing self-confidence and personal resourcefulness in acquiring the skills needed for adulthood. This chapter discusses the role of school organization in the attainment of self-regulation in terms of four levels of learning-specific skills: observation, emulation, self-control, and self-regulation. According to this formulation, socialization processes, such as modeling and social support, can greatly enhance youths' initiation and eventual regulation of their learning, especially during study or practice. The chapter also analyzes the functioning of self-regulated learners in terms of a cyclical model of self-regulation that links metacognitive processes, behavioral performance, and motivational beliefs in three successive phases: forethought, performance, and self-reflection. Descriptive research regarding expert performance and experimental research in diverse areas of skill, such as academic writing, sports, music, and health, is discussed in terms of the two models of self-regulation. Finally, the chapter considers the pedagogical implications of research on self-regulated learning and describes interventions designed to overcome deficits in adolescents' self-regulation. (Contains 91 references.) (KB)

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CHAPTER 1

ACHIEVING SELF-REGULATION

The Trial and Triumph of Adolescence[1]

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Adolescence was envisioned at the dawn of the 20th century by G. Stanley Hall as a period of "storm and stress" and at mid-century by Erik Erikson as a period of "identity versus identity confusion" (Grinder, 1978). Although the hazards of the passage from childhood to adulthood have continued to grow for each subsequent generation, social cognitive psychologists at the turn of the 21st century now describe this pivotal developmental transition in terms of the attainment of self-regulation. Unlike personality trait or stage views of self-regulation, a social cognitive account focuses on the metacognitive processes, behavioral skills, and associated motivational beliefs that underlie youths' growing self-confidence and resourcefulness in acquiring the skills needed to succeed in adulthood. These include such self-regulatory techniques as goal setting, strategy use, time management, self-monitoring, self-evaluation, and self-reflection. Operational definitions for these and other self-regulatory techniques will be provided later. There is substantial evidence that experts in diverse areas of skill from academics to sports utilize these techniques to learn and perform at optimal levels (Zimmerman, 2001).

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In this chapter, I discuss the role of school organization and students' development of self-regulation, distinctive levels in the development of self-regulation, the cyclical structure of self-regulation, and finally, interventions designed to overcome deficits in adolescents' self-regulation.

SCHOOL ORGANIZATION AND THE DEVELOPMENT OF SELF-REGULATION

The organization of schools is predicated on developmental improvements in students' academic and personal self-regulation. Schools are organized to provide greater social assistance in the early grades and to reduce that support as students advance to higher grades. During the primary grades, teachers regulate student learning by setting explicit guidelines for classroom functioning. In these grades, students are not expected to engage in significant self-regulated learning experiences outside the classroom, such as homework or studying, but during later elementary school grades, teachers assign homework for completion outside of class. Many of these youngsters have difficulty completing these homework tasks and must turn to their parents for assistance (Hoover-Dempsey et al., 2001). However, preadolescent students have developmental limitations in their acquisition, self-evaluation, and transfer of learning strategies (Pressley & Dennis-Rounds, 1980). Thus, although teachers and parents seek to develop elementary school students' academic self-regulation via assigned homework, the transition from social to self-regulation is often unsuccessful.

Despite these limitations in self-regulatory development, students enter middle schools having more fluid classroom environments as well as increased expectations for personal responsibility than in elementary school. In middle school, students are often taught academic subjects, such as mathematics or English, by different teachers and are expected to manage multiple homework assignments on their own. To succeed in this more demanding academic setting, students must assume greater responsibility and display greater personal initiative. Wigfield, Eccles, and Pintrich (1996) have reported substantial increases in the difficulty and amount of assigned homework during the middle school years at a time when parental support declines. This can lead to significant self-esteem problems for students who have failed to become sufficiently self-regulatory to function on their own. In addition, many students confront negative academic influences among their peers, such as name calling or social exclusion as a "geek" or "nerd," if they devote outside time to academic matters (Steinberg, Brown, & Dornbusch, 1996). However, students with a strong sense of self-regulatory efficacy can resist adverse academic influences of low-achieving peers better than those with a weak sense of self-efficacy

(Bandura, Barbaranelli, Caprara, & Pastorelli, 1996b). Self-efficacy is defined as perceived capability to learn or perform at designated levels of skill (Bandura, 1986).

During the high school years, adolescents experience further decreases in the structure of their academic environment as well as further increases in the amount and difficulty of homework. These students are taught subject matter by different teachers in different classrooms with different classmates and are expected to manage these diverse requirements personally. High school students are expected to complete not only teacher-assigned work but also to engage in self-initiated forms of studying, such as preparation for tests. Often, these tests play a pivotal role in gaining access to further educational opportunities, such as placement in advanced classes and entrance into college. Frequently, out-of-school employment or extracurricular activities, such as music and sports, must be managed along with homework and studying (Steinberg et al., 1996). Students are expected to develop self-regulatory skills, such as goal setting, self-monitoring, and time management, as well as sources of motivation to self-initiate and sustain learning (Zimmerman, Greenberg, & Weinstein, 1994). Many students respond to these increasing demands for self-regulation by adopting effective learning strategies, but a significant number of students do not adopt them (Zimmerman & Martinez-Pons, 1986, 1988, 1990). Students need to self-monitor their academic progress and to seek out teachers and peers for help when it is needed (i.e., a help-seeking strategy), but poorly regulated students are reluctant to ask for help, often fearing exposure to criticism or ridicule (Newman, 1994).

In summary, educators seek to instill greater academic self-regulation as students progress from childhood to adolescence by initially introducing many social and physical curricular supports in the classroom and by gradually withdrawing them as students are expected to develop self-regulatory skill. However, there is seldom any instruction in methods of studying or other self-regulatory skills, and there is substantial evidence that many students fail to acquire these skills on their own. Social learning researchers have begun to investigate how the transition to academic self-sufficiency can be facilitated by teaching or otherwise optimizing social and self-sources of regulation (Schunk & Zimmerman, 1997; Zimmerman, 2000). These researchers have identified hierarchical levels in learners' development of self-regulated functioning. These levels represent regulatory milestones in an optimal educational path, and they provide an explanation for students' success in not only academic subjects but also in other nonacademic areas, such as sports and music (McPherson & Zimmerman, in press; Zimmerman, 1998).

DEVELOPMENT OF SELF-REGULATORY SKILL

A social cognitive perspective (Schunk & Zimmerman, 1997; Zimmerman, 2000) envisions academic self-regulation as having social origins but ultimately involves students' development of covert cognitive and emotional processes as well as overt behavioral skills to manage social and physical environmental tasks (Bandura, 1986; Zimmerman, 2000). What changes developmentally is students' capability to self-regulate both internal processes and external forces *proactively*. For example, young children initially lack the foresight to set appropriate goals and the behavioral skill to implement an effective strategy for writing an essay, but they can respond *reactively* to goal setting and strategy use by social models (Graham, Harris, & Troia, 1998). When these forms of self-regulation are internalized from a model, learners are empowered to respond proactively on their own.

As toddlers, children learn that they can master new skills easily by watching skilled adult or sibling models perform. Complex skills, such as using a remote control on a television set, involve underlying cognitive strategies that are often difficult to induce and integrate into performance on one's own because they are abstract, covert, and have subtle or delayed effects that are often difficult to discern. For children to develop advanced levels of strategic skill, they often require personal feedback and support, such as verbal tuition and encouragement, during efforts to emulate a model. Bandura (1986) and other social cognitive researchers have found modeling, emulation, and social feedback to be very effective in conveying diverse academic and nonacademic skills.

A critic might argue that social modeling is an unsuitable source of self-regulatory skill because it inherently fosters social dependency. However, there is extensive evidence (Rosenthal & Zimmerman, 1978) that adult models withdraw their support as observing youngsters display emulative accuracy. Reciprocally, these youngsters, seeing their increased proficiency, seek to perform on their own, such as when a young boy spurns further assistance from his mother when he feels he can tie his own shoelaces. At this point, the boy's reliance on his mother as a social model becomes selective, and he will seek assistance from her mainly when he encounters obstacles, such as a novel type of shoelace. When youngsters reach adolescence, socialization agents, such as teachers and parents, expect an adaptive level of functioning, such as modifying one's technique on the basis of self-monitored performance outcomes.

Four milestones have been discerned in this social cognitive path to self-regulatory skill. To acquire a skill at an *observational level*, learners must carefully watch a social model learn or perform. This initial form of learning involves discrimination of the correct form of the skill from a model's performance and descriptions, such as when a novice language learner can

discern a difference between a native speaker's pronunciation of a word and second-language learner's (see Table 1.1). Complete induction of a skill seldom emerges from a single exposure to a model's performance, but rather, usually requires repeated observation, especially across variations in task, such as in hearing a word spoken in different sentences. Similarly, in the area of problem solving, learners who witness repeated variations in modeled examples learn more effectively (Rosenthal & Zimmerman, 1976). A novice's motivation to learn at an observational level can be greatly enhanced by positive vicarious consequences to the model, such as an audience's applause for a speaker. An observational level of skill has been acquired when a learner can discriminate qualitative levels in models' performances, such as discerning variations in the accuracy of a speaker's pronunciations.

Table 1.1. Social and Self-Sources of Regulation

	Features of Regulations →			
Levels of Regulation	*Sources of Regulation*	*Sources of Motivation*	*Task Conditions*	*Performance Indices*
Observation	Modeling	Vicarious reinforcement	Presence of models	Discrimination
Emulation	Performance and social feedback	Direct/social reinforcement	Correspond to models	Stylistic duplication
Self-control	Representation of process standards	Self-reinforcement	Structured	Automatization
Self-regulation	Performance/ outcomes	Self-efficacy beliefs	Dynamic	Adaptation

Social cognitive researchers have studied observational learning of a wide variety of academic, sport, and work skills from both live and symbolic (recorded or described) models. One series of studies (Zimmerman & Rosenthal, 1974b) showed that observing models affected children's induction and use of a wide variety of skills, such as language syntax usage (Guess, Sailor, Rutherford, & Baer, 1968), concept formation (Zimmerman & Rosenthal, 1972), problem solving (Laughlin, Moss & Miller, 1969), information seeking (Rosenthal, Zimmerman, & Durning, 1970), creativity (Zimmerman & Dialessi, 1973), and moral judgments and reasoning (Bandura & McDonald, 1963; Brody & Henderson, 1977). By contrast, asocial learning methods, such as self-guided discovery, have proven to be far less effective (Zimmerman & Kitsantas, 1996).

In addition to conveying cognitive or motoric skill, models often display discernable self-regulatory processes, such as adherence to performance standards and motivational orientations and values. For example, a linguis-

tic model who self-corrects a mispronunciation helps observers to discriminate and rectify common errors. Motivationally, such a model also conveys the high value placed on accurate speech and the need to persist in order to improve one's pronunciation. There is evidence (Zimmerman & Ringle, 1981) that the persistence of a model during complex problem solving affects the perseverance of observers, and there is evidence that models who display a preference for a particular task will vicariously increase observers' valuation of that activity (Zimmerman & Koussa, 1979). Observers' perception of similarity to a skilled model and perception of positive consequences to a model will increase their motivation to develop the skill further (Zimmerman & Rosenthal, 1974b).

To acquire skill at an *emulation level*, a learner must duplicate the general form of a model's response on a correspondent task. Learners seldom copy the exact actions of the model, but rather, they typically emulate the model's general pattern or style of functioning. For example, when elementary school children observed a model ask causal questions such as "What happens when you stick a pin in a balloon?" they subsequently emulated the model's causal style of question rather than specific words (Rosenthal et al., 1970). During efforts to emulate, learners can improve their accuracy and motivation if a model provides them with guidance, feedback, and social reinforcement (see Table 1.1). An emulative level of skill is attained when observers' responses approximate the general form or style of a model's on a similar task.

Although learners can induce the major features of a complex skill from observation, they require performance experiences in order for the skill to be incorporated into their behavioral repertoire. It is one thing to recognize the golf swing of a particular professional but quite another thing to reproduce that swing oneself. Learners who emulate using a model's task can master basic response elements before contending with new task variations. Emulation can be improved through individualized modeling and social support. For example, during participant modeling (Bandura, 1986), a model repeats selected aspects of a skill based on a learner's emulative accuracy. As the learner acquires rudimentary aspects of a skill, the model will introduce more difficult components. However, once an advanced level of mastery is attained, the model's support will be reduced.

Some critics have decried the use of modeling as a form of instruction because of fears that it fosters response mimicry during emulation. However, these fears are largely unwarranted because mimicry constitutes only a small part of emulative learning (Zimmerman & Rosenthal, 1974). Instead of duplicating a model's exact responses, observers primarily emulate the strategic features and blend them into their own repertoire of responses (Rosenthal et al., 1970). This blending occurs even when learners are told to copy a model's performance exactly. However, mimicry can

be reduced even further when learners are exposed to multiple modeling experiences. Observers who see a model vary his or her response to differing stimuli, such as differing types of Piagetian conservation tasks, will discriminate essential strategic elements from inessential ones (Rosenthal & Zimmerman, 1974a). Similarly, observers who see multiple social models demonstrate the same pattern will discriminate it better than those who witness only a single model perform (Brody & Henderson, 1977). This reduces mimicry because these observers have abstracted the underlying strategy more completely and can blend it more broadly into their personal repertoire of responses.

To attain a *self-controlled level* of self-regulatory skill, learners must practice it in structured settings outside the presence of models, such as when aspiring language learners practice their pronunciation by reading from a prepared text (see Table 1.1). To optimize learning at this level, learners should regulate their practice using representational standards (e.g., verbal recollections) of an expert model's pronunciation rather than direct observation of that model (Bandura & Jeffery, 1973). Learners' success in matching a covert standard during practice will determine the amount of self-reinforcement they will experience. For example, students in a language learning laboratory may self-monitor their pronunciation from an audiotape and will be motivated by close approximations to the covert standard (Ellis & Zimmerman, 2001). According to Bandura (1986), "by making self-satisfaction conditional on a selected level of performance, individuals create their own incentives to persist in their efforts until their performances match internal standards" (p. 467).

Self-controlled use of a skill is sustained also by self-instruction, such as self-praise or self-critical statements (Bandura, Grusec, & Menlove, 1967). Self-instruction can help students encode and retrieve strategy sequences (Meichenbaum & Beimiller, 1990). For example, Schunk and Rice (1984) trained elementary school students who were poor listeners to verbalize a listening strategy for choosing a pictorial referent to a story. These students displayed greater self-efficacy and listening accuracy than did students who did not verbalize the strategy. Similar results were obtained when acquiring a reading comprehension strategy: Strategy verbalization enhanced students' perceptions of efficacy and their academic performance (Schunk & Rice, 1985). During level three practice sessions, learners who focus on fundamental processes or technique rather than on learning outcomes are more successful in achieving automaticity (Zimmerman & Kitsantas, 1997, 1999), which is defined as the internalization of a model's technique. This automatized quality of regulation is the most apparent behavioral manifestation of the attainment of the third level of regulatory control. Although a skill becomes internalized at this level, it remains dependent on a representation of an external model's standard.

To acquire a *self-regulated level* of task skill, learners should practice it in unstructured settings involving dynamic personal and contextual conditions (see Table 1.1). At this fourth level of skill, learners must learn to make adjustments in their skill based on the outcomes of practice, such as whether a strategy solves a particular problem. These adaptations are made on the basis of self-monitored outcomes rather than prior modeling experiences. Learners' perceived efficacy in making these adjustments influences their motivation to continue. At level four, learners can practice with minimal process monitoring, and their attention can be shifted toward performance outcomes without detrimental consequences. For instance, second-language learners who practice their pronunciation skills in natural settings can shift their attention from articulation technique to outcomes, such as audience reactions. A self-regulated level of skill is acquired when learners can adapt their performance to changing personal conditions and outcomes.

For learners to adapt their performance, they must discriminate key features of the transfer context, choose how to adapt their skill to that context, and monitor and evaluate the results. In terms of cognitive processing, it is important to note that when skill becomes automatized (i.e., level three is attained), learners' attention is freed to focus on response outcomes (Lafferge, 1981; Neves & Anderson, 1981). A behavioral manifestation of level four functioning is learners' development of their own distinctive styles of performing. However, whenever self-monitoring reveals unexpected outcomes, learners will redirect their attention quickly to the details of strategy execution (Bandura, 1986). Often, instructors prematurely end instruction before the fourth level of self-regulatory functioning is achieved. Simply transferring regulatory control of a method of learning from external agents to adolescent learners (i.e., level three competence) will not necessarily equip the latter to remain self-directed in the face of changing situations. This more demanding level of functioning represents the most advanced level of self-regulation.

Thus, a multilevel analysis of the development of self-regulatory competence begins with the most extensive social guidance at the first level, but this social support is systematically reduced as learners acquire underlying self-regulatory skill. However, level four functioning continues to depend on social resources on a self-initiated basis, such as when a novelist seeks advice from a confidant about whether a plot or character is compelling. Because self-regulatory skill depends on context and outcomes, new performance tasks can uncover limitations in existing skills and require additional social learning experiences. This multi-level formulation does not assume that learners must advance through the four levels in an invariant sequence as developmental stage models assume, or that once the highest level is attained, it will be used universally. Instead, a multi-level model assumes that

students who master each skill level in sequence will learn more easily and effectively. Although level four learners have the competence to perform self-regulatively, they may not choose to do so because of low levels of motivation (Bandura, 1997). Various aspects of self-regulation, such as forethought planning, systematic self-monitoring, and intense self-reflection are mentally and physically demanding activities, and people may decide to forgo their use if they feel tired, disinterested, or uncommitted.

EVIDENCE OF LEVELS IN SELF-REGULATORY DEVELOPMENT OF SKILL

There is a growing body of evidence indicating that the speed and quality of learners' self-regulatory development and self-motivation are enhanced significantly if learners proceed according to a multilevel developmental hierarchy. To test the sequential validity of the first and second levels in the hierarchy, researchers compared the two primary sources of regulation for each level (i.e., modeling for observation level and performance and social feedback for the emulation level) in two studies (see column 2 in Table 1.1). The first study (Kitsantas, Zimmerman, & Cleary, 2000) involved the acquisition of dart-throwing skills by novice high school girls. Three observational learning groups were studied: a high-quality coping modeling group, a lower-quality mastery modeling group, and a no modeling (enactive learning) group. The mastery model performed flawlessly from the outset of the training, whereas the coping model initially made errors but gradually corrected them. Coping models are viewed as a qualitatively superior form of observational learning because they convey self-regulatory actions, such as self-monitoring and self-correction, as well as dart-throwing skills. By contrast, mastery models portray primarily dart-throwing skills. Both modeling groups learned initially by observing an adult demonstrate a multistep process dart throwing strategy, whereas the no modeling group learned only by hearing the multistep process described. Some members of each of the three experimental groups were given social feedback.

The results were supportive of a multilevel view of self-regulatory development. Adolescent girls in the two modeling groups significantly surpassed the dart skills of those who attempted to learn from only verbal description and performance outcomes. The coping model was significantly more effective than the mastery model, which indicates that the quality of the girls' observational learning experience influenced their development of skills. During emulation, girls who received social feedback learned better than those who practiced on their own. However, the impact of this social feedback was insufficient in the no modeling group to make up for the absence of vicarious experience. These results confirmed

the sequential advantage of engaging in observational learning before engaging in enactive learning experiences. Finally, the girls exposed to observational learning from either form of modeling also showed higher levels of self-motivation, such as self-efficacy beliefs, than did the students in the control group.

A similar research design was used to study writing revision with college students (Zimmerman & Kitsantas, in press). The students were asked to revise a series of sentences from commercially available sentence-combining workbooks. These exercises involved transforming a series of simple and often redundant sentences into a single, nonredundant sentence. For example, the sentences: "It was a ball. The ball was striped. The ball rolled across the room" could be rewritten as "The striped ball rolled across the room." The students were taught a three-step strategy for revising these multisentence problems by using coping or mastery models or by verbal description and direct practice. Social feedback was given to some students in each experimental group.

Students in the two modeling groups, which had the benefit of some form of observational learning, significantly surpassed the revision skill of those who attempted to learn from only verbal description and performance outcomes. Students who observed the higher-quality coping model outperformed students who observed the lower-quality mastery model. As did the dart-throwing study, the writing study demonstrated that self-regulatory skills, such as self-monitoring and self-correcting actions of the coping model, were learned vicariously. As was found in the dart study during enactive learning, social feedback improved writing skills for both forms of modeling. Once again, social feedback was insufficient for students in the no modeling group to make up for their absence of vicarious experience. Finally, students exposed to both forms of modeling displayed higher levels of self-motivation, such as self-efficacy beliefs, than did students who relied on discovery and social feedback. These academic writing results confirmed the sequential advantages of engaging in observational learning before attempting enactive learning experiences.

To test the sequentiality of the third and fourth levels of skill (i.e., self-control and self-regulation) in the multilevel hierarchy, the two primary sources of regulation for these levels (i.e., process standards and outcomes) were compared in two studies (see column 2 in Table 1.1). Recall that process goals are hypothesized to be optimal during acquisition at the self-control level, but outcome goals are expected to be superior during the acquisition at the self-regulation level. Zimmerman and Kitsantas (1997) used the same dart throwing athletic task described above to examine the effectiveness of goal shifting during dart throwing practice with high school girls. A process goal group focused on practicing the strategy steps for acquiring dart-throwing technique, whereas an outcome goal

group focused on improving their scores. The "bull's eye" on the target had the highest numerical value and the surrounding concentric circles gradually declined in value. An optimal goal-setting group from a multilevel perspective shifted from process goals to outcome goals when automaticity was achieved. Self-recording was taught to some girls in each goal group. Girls in the process-monitoring group recorded any strategy steps they may have missed on each practice throw, whereas girls in the outcome-monitoring group wrote down their target scores for each throw. Girls in the shifting goal group changed their method of self-monitoring when they shifted goals. Before being asked to practice on their own, all of the high school girls were taught strategic components of the skill through observation and emulation (levels one and two). The experiment compared the effects of process goals, outcome goals, and shifting goals as well as self-recording during self-controlled practice.

The results were consistent with a multilevel hierarchical view of goal setting: Girls who shifted goals developmentally from processes to outcomes surpassed classmates who adhered to only process goals or to only outcome goals in posttest dart throwing skills. Girls who focused on outcomes exclusively were the lowest in dart-throwing skills. Self-monitoring assisted learning for all goal-setting groups. In addition to their superior learning outcomes, students who shifted their goals displayed superior forms of self-motivation, such as self-efficacy beliefs.

A second study (Zimmerman & Kitsantas, 1999) that tested the sequentiality of the third and fourth levels (i.e., self-control and self-regulation) of skill was conducted with high school girls using the writing revision task described earlier. All of the adolescent girls in this study were initially taught the three steps of the revision strategy through observation and emulation (regulatory levels one and two) that was described previously. During a practice session following training, girls in the process goal group focused on strategic steps for revising each writing task, whereas girls in the outcome goal focused on decreasing the number of words in the revised passage. Some of the girls in each goal group were ask to self-record. Once again, the optimal group shifted from process goals to outcome goals when automaticity was achieved. Girls in the process-monitoring group recorded strategy steps they missed on each writing task, whereas girls in the outcome-monitoring group wrote down the number of words used in each writing task. Girls in the shifting goal group changed their method of self-monitoring when they shifted goals. Thus, the experiment compared the effects of process goals, outcome goals, and shifting goals as well as self-recording during self-directed practice.

The results were consistent with a multilevel hierarchical view of goal setting: Girls who shifted goals from processes to outcomes after reaching level four (i.e., having achieved automaticity) surpassed the writing-revi-

sion skills of girls who adhered exclusively to process goals or to outcome goals. Girls who focused on outcomes exclusively displayed the least writing skills, and self-recording enhanced writing acquisition for all goal setting groups. In addition to their superior writing-skill outcomes, girls who shifted their goals displayed advantageous forms of self-motivation, such as enhanced self-efficacy beliefs.

In summary, there is a growing body of evidence indicating that advanced levels of academic or athletic skills and motivation are readily attained when social learning experiences followed a multilevel regulatory training approach. These studies also indicated the importance of the various sources of self-regulatory development at each level in the hierarchy (see column 2 of Table 1.1), such as the quality of modeling, social feedback, process goals, and performance outcomes. In these studies, students were trained socially to use each of these key processes, and there was evidence that these processes not only enhanced acquisition of skill but also self-motivation. Next, I consider the issue of how goal setting, self-monitoring, and self-efficacy, as well as other self-regulatory processes and self-motivational beliefs, are interrelated and how they become self-sustaining.

A CYCLICAL VIEW OF SELF-REGULATION

There is growing evidence that students' self-regulatory processes and accompanying self-motivational beliefs influence learning in three successive phases: forethought, performance, and self-reflection. Forethought phase processes precede efforts to act in a self-regulated way and prepare the way for these efforts. Performance phase processes occur during motoric efforts and are designed to affect attention and action. Self-reflection phase processes occur after performance efforts and influence a person's response to those efforts. Finally, the latter phase processes influence forethought planning of subsequent performance efforts in cyclical fashion.

Forethought Phase

There are two major categories of forethought: task analysis and self-motivational beliefs (see Figure 1.1). A key form of task analysis, *goal setting*, is defined as specifying intended outcomes of learning or performance (Locke & Latham, 1990), such as memorizing a list of spelling words during a study session. Goals that are specific, proximal, and challenging are more effective than goals that are diffuse, delayed, and easily attained (Bandura & Schunk, 1981). Researchers, such as Bandura (1991) and Carver and Scheier (1981), have concluded that the goal systems of highly

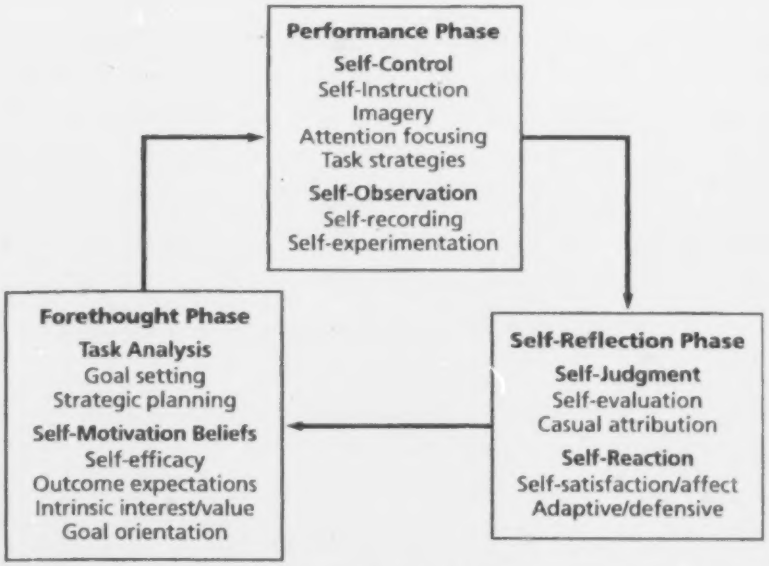

Figure 1.1. Phases and subprocesses of self-regulation. From "Motivating self-regulated problem solvers" by B.J. Zimmerman & M. Campillo (in press). In J. E. Davidson & R. J. Sternberg (Eds.), *The nature of problem solving*, New York: Cambridge University Press. Copyright by Cambridge University Press. Reprinted with permission.

self-regulated individuals are organized hierarchically, with process goals operating as proximal regulators of more distal outcome goals. Hierarchical goals enable learners to guide their learning over longer time intervals without outside support because as one goal is accomplished, the learner can shift to the next goal in a hierarchy, such as the next item in a priority list of homework assignments.

A second form of task analysis is *strategic planning* (Weinstein & Mayer, 1986). Self-regulative strategies are defined as specific cognitive processes and associated actions designed to acquire or display skill (Zimmerman, 1989). When strategies are chosen and adapted to a specific task, they can enhance learners' cognition, affect, and motoric execution (Pressley, Woloshyn, & Associates, 1995). For example, imagistic or self-instruction strategies can enhance the recall on memory tasks (Bandura & Jeffery, 1973; Pressley, 1977). Strategies cannot be applied without planning and adjustments because of changing personal, behavioral, and environmental

conditions. The effectiveness of a self-regulatory strategy will vary from person to person and will change during the course of acquisition. For example, an initial acquisition strategy often declines in usefulness as a person masters a skill, and another strategy should replace it, such as when a novice writer shifts from outlining strategy for generating text to a revision strategy for making literary corrections.

Because self-regulation of a skill involves self-initiative and persistence, it is essential to understand underlying sources of motivation. Goal setting and strategic planning have been linked in both theory and research to a number of key self-motivational beliefs, namely, self-efficacy, outcome expectations, intrinsic interest or valuing, and goal orientation. *Self-efficacy* refers to the beliefs about having the personal capability to learn or perform effectively, whereas *outcome expectations* refer to beliefs about the ultimate benefits or liabilities of performance (Bandura, 1997; Pajares, 1996). For example, self-efficacy may refer to students' belief that they can earn a grade of A in a writing course, and outcomes refer to beliefs about the likelihood that this grade in writing will help them gain an editorial position in a book publishing company. There is evidence that students' self-efficacy beliefs are very predictive of their goal setting and strategic planning (Bandura & Schunk, 1981; Zimmerman & Martinez-Pons, 1990). Self-efficacy beliefs influence goal setting because the more capable people believe themselves to be, the higher the goals they set for themselves and the more firmly committed they remain to those goals (Bandura, 1991; Locke & Latham, 1990). When students fall short of attaining their outcome goals, those who are self-efficacious increase their efforts, whereas those who are self-doubters withdraw (Bandura & Cervone, 1983). Goals also affect self-efficacy beliefs because self-regulated learners feel more self-efficacious when they choose goals that are specific and proximal. Attaining a proximal goal gives learners immediate satisfaction, whereas attaining distal goals delays satisfaction for long periods of time.

Two other beliefs have a self-motivational influence on self-regulation. *Intrinsic interest* refers to valuing an activity or skill for its inherent properties rather than for its ultimate external ends (Deci, 1975; Lepper & Hodell, 1989). Students with an intrinsic interest in a task are more motivated to plan and use learning strategies during efforts to study (Zimmerman & Kitsantas, 1997). A closely associated belief involves learners' *goal orientation*, which refers to their general reason for studying in school. The most advantageous goal orientation for initiating and sustaining academic study has been described as a learning, mastery, or task goal orientation, whereas the most disadvantageous belief has been referred to as a performance or ego goal orientation (see, e.g., Ames, 1992; Dweck, 1988; Nicholls, 1984). For example, a student who learns the piano for personal enjoyment will be better motivated than will a student who learns to avoid

performing poorly during a competition. The distinction between learning and performance goals parallels the distinction between intrinsic and extrinsic interest (Pintrich & Schunk, 1996). There is evidence that students with a learning goal orientation display higher levels of cognitive strategies, such as elaboration and comprehension monitoring, than do students with a performance goal orientation (Pintrich & De Groot, 1990).

Performance Phase

Two major types of performance or volitional control processes have been studied to date: self-control and self-observation. Self-control processes enable learners, as well as performers, to optimize their perceptual and behavioral functioning. For example, *self-instruction* refers to overt or covert self-verbalization during execution of a task, such as counting musical notes aloud to help one learn a melody on the piano. Research shows that self-verbalizations, ranging from mnemonic rehearsal to self-praise statements, can improve students' learning (Schunk, 1982, 2001). Self-instruction has often been used with learning-disabled students to help them overcome hyperactivity or impulsivity (Meichenbaum, 1977). A second form of self-control, *imagery*, refers to the forming of mental pictures and is widely used to assist encoding and performance. Pressley, Levin, and colleagues (Pressley, 1977; Pressley & Levin, 1977) have conducted extensive research on the effectiveness of training youth to form mental images to assist representation and recall. Imagery has been used widely by sports psychologists to teach competitors, such as skaters, divers, or gymnasts to enhance their performance (Garfield & Bennett, 1985).

A third form of self-control, *attention focusing*, refers to methods designed to improve one's concentration and screen out other covert processes or external events, such as when a student turns off recorded music in order to memorize a list of foreign language words. Increasing one's concentration is often listed as the most difficult form of self-regulated learning—perhaps because so many distractions currently exist in adolescents' environments (Zimmerman & Bandura, 1994). In academic areas of functioning, Kuhl (1985) has studied dysfunctions in attention control, such as distractability and rumination about past mistakes. His research, along with that of others (Corno, 1993; Weinstein, Schulte, & Palmer, 1987), has demonstrated that strategies for focusing and screening out events are beneficial for effective studying. Expert performers on nonacademic tasks, such as music, have been found to use a wide variety of attention training techniques, ranging from ignoring the presence of an audience to slow-motion task execution (Mach, 1988). A fourth form of self-control, *task strategies*, refers to methods for reducing complex tasks to

their essential parts and reorganizing them into a systematic performance sequence. For example, when students watch a teacher demonstrate an algebraic solution, they might identify key steps, record them in their notes, and create an acronym to guide their solutions. A wide variety of task strategies have been identified, and their effectiveness has been well documented (Pressley et al., 1995; Weinstein & Mayer, 1986). These include study strategies, such as note taking, test preparation, and reading for comprehension, as well as performance strategies for optimizing writing, speech elocution, and problem solving.

A second type of performance control process is self-observation, which refers to a person's self-monitoring or tracking of specific aspects of one's own performance, the conditions that surround it, and the effects that it produces (Zimmerman & Paulsen, 1995). Although the importance of this process may seem obvious, most learners and performers engage in self-observation in only the most cursory way. Self-monitoring is difficult because the amount of information involved in complex performances can easily overwhelm naive self-observers and can lead to disorganized or superficial self-monitoring. As a beginning tennis player once complained, "I have too much trouble watching the ball to worry about my footwork and racket preparation!" Experts are able to track themselves at a detailed level because they know how and when to be selective. Poorly hit tennis shots will be diagnosed by experts as involving breakdowns in a particular area, such as in footwork, and that will be the focus of experts' subsequent self-observation. Setting hierarchical process goals during forethought can facilitate selective self-observation because these goals direct attention to specific performance processes and associated external events.

In addition to selectivity, there are a number of other features of self-observation that influence its effectiveness. For example, the temporal proximity of one's self-observations is important because delayed self-feedback precludes a person from taking corrective action in a timely fashion (Bandura, 1986; Kazdin, 1974). When taking a timed test, students who monitor their use of time during a test can make important adjustments before adverse consequences can occur. A third feature of high quality self-observation is the informativeness of performance feedback. When learners practice a skill in a standardized or structured setting, they can derive more information from their results (Ericsson & Lehman, 1996). For example, when preparing for an entrance exam in writing, students will find practice tests that are identical in format to the exam are much more informative in judging writing progress than unstructured writing exercises. A fourth qualitative feature is the accuracy of self-observations. As was noted in the discussion of level-one regulation, accurate self-perception often depends on prior observational learning. Untrained individuals often misperceive or distort their self-observations. For example, there is

evidence that speakers of minority dialects need special training to discriminate erroneous word pronunciations before they could practice in a self-corrective fashion on their own (Ellis & Zimmerman, 2001). A fifth qualitative feature of self-observation involves the valance of the behavior. It is often very depressing to self-monitor negative aspects of one's functioning, such as errors in grammar or spelling (Kirschenbaum & Karoly, 1977), but it is usually possible to shift to positive criteria, such as correctly written sentences or correctly spelled words.

One way to increase the proximity, informativeness, accuracy, and valence of feedback is to *self-record* it (Zimmerman & Kitsantas, 1996). Written records have many advantages, such as capturing personal information when it occurs, structuring it to be most meaningful, preserving its accuracy, and providing a longer database for discerning change. If self-recorded information is still ambiguous, learners can engage in *self-experimentation* by systematically varying aspects of their functioning that are in question (Bandura, 1991). For example, an aspiring adolescent novelist may be concerned about her lack of consistent progress in completing her first book. Her moments of inspiration and production of text have been sporadic and insufficient, and she urgently needs to increase her effectiveness. She can self-experiment by testing various hypotheses about her progress, such as her time, place, and method of writing. Which method or combination increases the quality and quantity of written text can be discerned from self-records (Zimmerman & Risemberg, 1997). In this way, systematic self-observation or self-monitoring can lead to greater personal understanding and to better performance control.

Self-Reflection Phase

There are two major types of self-reflection: self-judgment and self-reactions (Bandura, 1986). Self-judgment involves self-evaluating one's performance and attributing causal significance to the results. *Self-evaluation* refers to comparing self-monitored information with a standard or goal, such as when competitors in a national spelling bee compare their daily practice tests to their best previous effort, to the efforts of other competitors, or to published standards of word difficulty. Self-evaluations are not automatic outcomes of performance, but rather, depend on learners' selection and interpretation of an appropriate standard. Students who begin their preparation for a spelling competition by expecting to spell all the most difficult words correctly will be disappointed by their results. To be optimally effective, self-evaluative standards must be set at levels that are challenging for the learner (i.e., difficult but attainable). Setting standards that are too high will discourage, and setting standards that are too low will

fail to produce progress. Optimal self-evaluation involves shifting one's goals based on learning progress. "Writer's block" is often due to setting unrealistic literary standards, and often it is preferable for writers to set a lower standard for generating text, then raising the standard during the revision process (Murray, 1984). Research on brainstorming has also revealed the advantage of separating the generation of ideas from their evaluation (Torrance, 1961).

There are advantages to using one's previous performance as a standard of comparison instead of the performance of others. Self-comparisons involve personal changes in functioning over time, and, as a result, they highlight learning progress, which typically improves with repeated practice. By contrast, social comparisons with the performance of others (who are simultaneously learning) diminishes awareness of personal improvements due to practice. Many athletic coaches are reluctant to place pupils in competitions (where social comparison is inevitable) until they are very likely to succeed at some level in order to ensure favorable self-evaluations.

Self-evaluative judgments are linked closely to *causal attributions* about the results, such as whether one's poor performance on a mathematics test is due to limited ability or to insufficient effort. These attributional judgments play a pivotal role in self-reflection: Attributions of error to fixed sources (i.e., ability) prompt learners to react negatively and discourage efforts to improve (Weiner, 1979). By contrast, attributions of error to controllable sources, such as learning strategies, will sustain motivation during periods of deficient performance because strategy attributions sustain perceptions of efficacy until all possible strategies have been tested (e.g., Zimmerman & Kitsantas, 1996, 1997). Attributions are not automatic outcomes of favorable or unfavorable self-evaluations, but rather, depend on cognitive appraisal of extenuating factors, such as perceptions of personal efficacy or mitigating environmental conditions (Bandura, 1991). For example, when students receive a low grade for an essay, those who are self-efficacious are more likely to attribute it to insufficient effort or a poor writing strategy than those who are self-doubters. By contrast, self-doubters are likely to interpret a low grade as further evidence of their lack of writing ability.

Self-evaluative and attributional self-judgments are closely linked to two key forms of self-reactions: self-satisfaction and adaptive inferences. *Self-satisfaction* refers to perceptions of satisfaction or dissatisfaction and associated emotional affect regarding one's performance, which is important because people pursue courses of action that result in satisfaction and positive affect and avoid courses that produce dissatisfaction and negative affect, such as anxiety (Bandura, 1991). Like other self-reflective processes, self-satisfaction is not an automatic outcome of performance, but rather, depends on learners' self-judgmental criteria as well as forethought goals

and performance phase strategy use. When self-satisfaction is contingent upon reaching adopted goals, people give direction to their actions and motivate themselves to persist in their efforts to learn. Thus, a person's motivation does not stem directly from the goals per se but rather from self-satisfaction reactions to performance outcomes.

A person's level of self-satisfaction also depends on the intrinsic value or importance of the task. For example, students who greatly value a particular skill will experience severe dissatisfaction and anxiety if they obtain adverse outcomes. However, students who view a skill as peripheral to their interests will not be overly distressed by adverse outcomes. Students who feel highly self-efficacious about their capabilities to learn or perform a skill, such as playing a musical instrument, will also express greater satisfaction with the outcomes (Zimmerman & Kitsantas, 1997).

Adaptive or defensive inferences refer to self-reactive inferences by students about how to alter their self-regulatory approach during subsequent efforts to learn or perform. Adaptive inferences are important because they guide students to new and potentially more effective forms of performance self-regulation, whereas defensive inferences serve primarily to protect the person from future dissatisfaction and aversive affect. Defensive self-reactions, such as helplessness, procrastination, task avoidance, cognitive disengagement, and apathy, are self-handicapping because they ultimately limit personal growth (Garcia & Pintrich, 1994). These self-reactions affect forethought processes during additional efforts to learn. For example, self-satisfaction reactions strengthen self-efficacy beliefs about eventually mastering the academic skill, learning goal orientations (Schunk & Ertmer, 1999), and intrinsic interest in the task (Zimmerman & Kitsantas, 1997). These enhanced self-motivational beliefs form the basis for adolescents' sense of personal agency about continuing their cyclical self-regulatory efforts and eventually attaining their goals.

There is a growing body of experimental and descriptive evidence linking forethought, performance, and self-reflection phase processes and beliefs. For example, experimental manipulations of goal setting and self-recording has been shown to affect self-reflection phase processes and beliefs, such as self-evaluation, attributions, and changes in strategy choice. Those self-reflection processes were shown in turn to affect learners' intrinsic interest in the task and self-efficacy beliefs about further learning efforts (e.g., Zimmerman & Kitsantas, 1997, 1999). When experts and novices are compared in their forethought, performance, and self-reflection phase processes, significant differences were found in every phase (Cleary & Zimmerman, 2000).

OVERCOMING DEFICITS IN ADOLESCENTS' SELF-REGULATION

The consequences of dysfunctions in personal regulation can be enormous for adolescents. For example, students who struggle to self-regulate their academic studying achieve more poorly in school (Zimmerman & Martinez-Pons, 1986, 1988) and display more deportment problems (Brody, Stoneman, & Flor, 1996). Furthermore, teenagers often are unable to regulate their health through proper diet, taking needed medicines, and avoiding exposure to disease. For example, people who cannot self-regulate the chronic disease of asthma display higher levels of symptoms, lower quality of life, and are hospitalized more frequently (Zimmerman, Bonner, Evans, & Mellins, 1999). Calamities such as death, injury, and sickness among youth and young adults can often be traced to a failure to self-regulate a variety of dangerous behaviors, such as drinking alcohol, taking recreational drugs, engaging in unprotected sex, and driving with excessive speed. There is evidence that the incidence of misbehavior, aggression, and crime of youth is associated with poor impulse control and disengagement of moral self-regulatory standards (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996a). These self-regulatory problems of youth are not merely the result of misinformation about difficulties of adulthood; they entail developing appropriate skills, self-beliefs, habits, and styles of living (Prochaska, DiClemente, & Norcross, 1992). But how can these advantageous forms of self-regulation be developed among adolescents?

From cyclical phase perspective on self-regulation, dysfunctions are linked to ineffective forethought and performance phase techniques, such as absence of appropriate goal setting or strategy use (Bandura, 1991; Zimmerman, 1998). Instead of using these proactive methods, ineffective students rely primarily on reactive methods to manage their academic learning and health, such as responding to adverse grades or health outcomes. Unfortunately, reactive methods of self-regulation can lead to a *self-defeating cycle* of performance that is difficult to overcome. For example, because reactive self-regulators fail to set specific process goals, they are limited to self-monitoring performance outcomes. To self-evaluate their performance outcomes, reactive learners typically turn to the outcomes of others, but this social criterion can be daunting because other learners are improving as well. Furthermore, reactive learners' lack of strategic planning not only diminishes the quality of their performance, it prevents them from attributing unfavorable outcomes to strategy use, which can sustain motivation. Instead, reactive learners' reliance on social criteria for self-evaluation leads them to attribute their errors to fixed ability, to experience self-dissatisfaction, and to react defensively. Because of these adverse self-reactions to their task outcomes, reactive self-regulators experience not

only a loss of self-efficacy about subsequent performance efforts but also a decline in intrinsic interest (Zimmerman & Kitsantas, 1996).

Fortunately, there is growing evidence that interventions that target specific deficits in self-regulatory processes in children and adolescents, such as the absence of forethought goal setting and strategic planning, can lead to *self-enhancing cycles* of learning and improved academic and nonacademic outcomes (Schunk & Zimmerman, 1998; Zimmerman & Schunk, 2001). For example, Graham and colleagues (1998) used modeling, emulation, and self-directed practice to teach learning-disabled (LD) students strategies to improve their writing skills. Lan (1998) taught college students in a statistics course to self-monitor their acquisition of and self-efficacy beliefs about key concepts in the discipline. Improved self-monitoring led to improved grades in the course. Butler (1998) taught LD collegiate students to analyze instructional tasks and select appropriate learning strategies through tutoring. She found that trained students displayed more positive perceptions of task-specific efficacy and were more likely to attribute successful performance to self-regulated sources, such as strategy use. In nonacademic areas of functioning, there is evidence that training mothers and their asthmatic children to self-regulate their youngster's symptoms using medicating strategies, self-monitoring, and self-reflective interpretation of outcomes can not only improve their level of self-regulation but also their lung functioning on a variety of measures (Bonner et al., in press).

CONCLUSION

Clearly, an essential aspect of passage from childhood to adulthood is adolescents' acquisition of self-regulatory skills. Although schools are organized on the assumption that students will develop increased self-regulation of their academic functioning, there is extensive evidence that many students fail to make this vital transition. Social cognitive researchers have identified four levels in the development of self-regulatory skill, beginning with social modeling and emulation and then shifting to self-control and self-regulation. There is evidence that students who master a skill, whether academic or nonacademic, according to this multilevel sequence display higher levels of acquisition as well as better motivation and greater self-regulation than students who use alternative methods or a different sequence.

In an effort to understand how self-regulatory processes become self-sustaining, social cognitive researchers have identified three key cyclical phases: forethought, performance, and self-reflection. These phases specify links between a person's use of self-regulatory processes, such as goal setting and strategy use, and self-motivational beliefs, such as self-efficacy

and intrinsic interest. Advantageous self-motivational beliefs are essential because self-regulation involves self-initiation and self-sustained effort. When analyzing adolescents from a cyclical phase perspective, there is evidence that dysfunctions in achievement are linked to adolescents' use of reactive methods of self-regulation rather than proactive methods. Reactive learners fail to engage in effective forethought, such as setting specific process goals, but instead rely on reactions to performance outcomes, which are frequently adverse. However, when students who display low levels of self-regulation have been taught specific processes, such as learning strategies and self-monitoring techniques, there is evidence of impressive gains in functioning. These promising findings offer hope to educators and parents who have viewed poor self-regulation as an inevitable shortcoming of adolescence.

NOTE

1. I would like to thank Frank Pajares and Tim Urdan for their helpful comments on an initial draft of this chapter. Correspondence regarding this chapter should be directed to Barry J. Zimmerman, Graduate School and University Center, City University of New York, PhD Program in Educational Psychology, 365 Fifth Ave., New York, NY 10016-4309, or bzimmerman@gc.cuny.edu.

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